
~ ~ HURRICANE OPAL ~ ~
FLORIDA PANHANDLE
WIND AND WATER LINE SURVEY



Prepared by Michael Baker Jr, Inc.
Oct. '95

**HURRICANE OPAL
FLORIDA PANHANDLE
WIND AND WATER LINE SURVEY**

OCTOBER 1995

Prepared by

**Michael Baker Jr., Inc
Alexandria, VA**

for

**Federal Emergency Management Agency
Washington, D.C.**

and

**Property Loss Research Bureau
Schaumburg, IL**

QC945.5.073.H8 1995

Hurricane Opal - Wind and Water Line Survey

ACKNOWLEDGMENTS

Responding to the request for a wind and water line survey to document the approximate storm surge inundation limits caused by Hurricane Opal required a cooperative effort of many individuals and agencies. We would like to thank all of those involved with this effort, and specifically, the following individuals who provided assistance during the coordination, preparation, deployment, and field surveys the week following the landfall of Hurricane Opal along the Florida panhandle shoreline on October 4, 1995:

James Shortley, Chief, Property Claims Division, FEMA, Washington, D.C.
William Massey, FEMA Region IV, Atlanta, GA
Michael Buckley, Chief, Hazard Identification Branch, Mitigation Directorate, FEMA,
Washington, D.C.
Karl Mohr, Mitigation Directorate, FEMA, Washington, D.C.
Hugh Strawn, Disaster Catastrophe Service, Property Loss Research Bureau
Howard Wittington, Chief, Hydrology and Hydraulics Branch, U.S. Army Corps of
Engineers, Mobile District
Doug Otto, Chief, Hydrologic Investigations Section, U.S. Army Corps of Engineers,
Mobile District
John (Bud) Lee, Hydrologic Investigations Section, U.S. Army Corps of Engineers,
Mobile District
Glen Duvall, Hydrologic Investigations Section, U.S. Army Corps of Engineers, Mobile
District
Steve Davis, Hydrologic Investigations Section, U.S. Army Corps of Engineers, Mobile
District
Ray Townsend, U.S. Army Corps of Engineers, Coastal Engineering Research Center
Tom Waters, Florida Department of Environmental Protection, Bureau of Beaches and
Coastal Systems

Hurricane Opal - Wind and Water Line Survey

INTRODUCTION

Michael Baker Jr., Inc., on behalf of the Federal Emergency Management Agency (FEMA) and Property Loss Research Bureau (PLRB), conducted a wind and water line survey of the Hurricane Opal landfall area near Navarre and Ft. Walton Beach in Santa Rosa County, Florida, and other areas east of the landfall to Mexico Beach in Bay County, Florida. The goal of the investigation and study was to determine the approximate high water elevation of the storm surge and combined storm surge and wave runup in the open coast and inland bay areas affected by Hurricane Opal. The establishment of a wind and water line documents the inundation limits of the storm surge flooding and areas subject to both flooding and wind damages or losses. Areas outside of the inundation zone would likely be subject to only wind damages and losses.

The high water marks (HWM) observed and surveyed for this report throughout the Hurricane Opal impact area reflect either the stillwater elevation of the storm surge (areas outside the influence of breaking wave and wave runup) or the stillwater elevation plus the wave runup component (areas in the wave swash zone - either breaking waves or wave runup).

The stillwater elevation HWMs are generally recovered inside (i) of commercial or residential structures and found as mud lines on walls or doors. The storm surge plus wave runup HWMs are generally found as debris or trash lines along the coastal dunes, sloping terrain of the bay shoreline or the outside (O) perimeter and exterior area of a structure. Each HWM is marked and located on a map accordingly, providing another piece of the puzzle, and documenting the approximate water surface elevation used to establish a wind/water line. The information also assists in understanding the nature of the storm influence in the immediate area.

HURRICANE OPAL - STORM SUMMARY

As of October 13, 1995, there have been 17 named tropical storms and hurricanes for the 1995 Hurricane season, making it the most active season since 1933 (with 21 tropical storms and hurricanes). After passing over the Yucatan Peninsula, the 15th storm of the season, Hurricane Opal, intensified in the early morning hours on Tuesday October 3 while in the Bay of Campeche area of the Gulf of Mexico. Hurricane Opal started moving to the north-northeast while gaining size and intensity over the next day and half.

The landfall of Hurricane Opal along the Florida panhandle coastline (see map in Appendix A), near Ft. Walton Beach, was the second hurricane of the season to impact the panhandle area. Hurricane Erin, a Category 1 hurricane on the Saffir-Simpson scale (Table 1), passed through the

Hurricane Opal - Wind and Water Line Survey

Table 1. Saffir-Simpson Hurricane Scale Ranges.

Scale Number (Category)	Central (mbar)	Pressure (in)	Winds (mi/h)	Surge (ft)	Damage
1	≥ 980	≥ 28.94	74 - 95	4 - 5	Minimal
2	965 - 979	28.50 - 28.91	96 - 110	6 - 8	Moderate
3	945 - 964	27.91 - 28.47	111 - 130	9 - 12	Extensive
4	920 - 944	27.17 - 27.88	131 - 155	13 - 18	Extreme
5	< 920	< 27.17	> 155	> 18	Catastrophic

Source: Hebert, Jarrell, and Mayfield, 1995.

region in early August, causing flooding and damages along the coast. Hurricane Opal's landfall as a Category 3 storm included 125 mph (110 kt) winds and expected storm surges up to 15 foot in height, significantly more damaging than Hurricane Erin. The coastal flooding affected the coastal areas from Gulf Shores, Alabama to Tampa, Florida, with hurricane force winds impacting Florida, Alabama and Georgia, and tropical storm force winds stretching from Florida upward into North Carolina and Tennessee. Fortunately for the Gulf of Mexico coastal residents, Hurricane Opal was losing intensity as it approached the coast on Wednesday, October 4. At mid-day on October 4, Hurricane Opal had been classified as a Category 4 hurricane with winds close to 150 mph (130 kt). The cooler waters of the northern Gulf of Mexico and other atmospheric conditions appear to have been the cause of the reduced intensity of Hurricane Opal at time of landfall on October 4, estimated to have occurred around 6:00 PM Central Daylight Time (CDT) (or approximately time 2200 Z).

Preliminary estimates place Hurricane Opal as the third costliest natural disasters to affect the United States this century, right after Hurricane Andrew and the Northridge Earthquake. In Florida alone, the damage estimates range from \$1.8 to 2.8 million, with the numbers increasing daily as more damage reports are received. The coastal and bay storm surge impacts were far reaching and appear to be the major cause of destruction and damages to commercial and private residences. The storm surge also overtopped and eroded 10 to 30 foot high dune fields on the barrier island beaches of Santa Rosa Island, with the high surf accompanying the storm surge scouring and undermining the foundations on oceanfront structures from Destin to Panama City Beach resulting in settlement or collapse into the ocean. The wind impacts continued from the Florida panhandle up into Tennessee and North Carolina.

Hurricane Opal - Wind and Water Line Survey

HIGH WATER MARK SURVEY SUMMARY

The HWM information was collected during the field survey period from October 6 to 10, 1995, immediately following the landfall of the storm. The HWM surveys and HWM elevations shown on the maps in Appendix B were conducted and collected through a joint effort by Michael Baker Jr., Inc. and the U.S. Army Corps of Engineer's Hydrologic Investigations Section, Mobile District. The recorded HWM stillwater and combined stillwater/wave runup elevations ranged from 6 feet at the east end of Choctawhatchee Bay to over 20 feet along the coast near Grayton Beach in Walton County (Table 2). Other HWM surveys are currently underway by the Alabama and Florida Geological Survey for the Alabama and Pensacola-Appalachicola-Carrabelle areas, but are not included in this report.

Table 2. Hurricane Opal High Water Mark survey information.

<u>HWM #</u>	<u>Elev. (ft)</u>	<u>Type</u>	<u>Location</u>	<u>Latitude</u>	<u>Longitude</u>
1 a	10.5	(O)	Santa Rosa Island	86:59:29	30:21:29
1 b	9.8	(O)	Santa Rosa Island	86:56:10	30:22:01
1 c	10.2	(O)	Santa Rosa Island	86:56:10	30:22:01
1 d	9.9	(I)	Santa Rosa Island	86:52:07	30:22:52
1 e	10.2	(O)	Santa Rosa Island	86:52:07	30:22:52
1 f	11.1	(O)	Santa Rosa Island	86:51:13	30:22:56
1	10.9	(O)	Santa Rosa Island	86:48:28	30:23:23
2	9.8	(I)	Wynnhaven Beach	86:47:22	30:24:26
3	9.0	(O)	Santa Rosa Island	86:42:05	30:24:03
4	7.6	(O)	Mary Esther	86:42:08	30:24:31
5	10.9	(I)	Ft. Walton Beach	86:38:41	30:24:25
6	8.6	(I)	Ft. Walton Beach	86:37:30	30:24:15
7	7.5	(O)	Santa Rosa Island	86:35:26	30:23:40
8	11.3	(I)	Santa Rosa Island	86:31:36	30:23:17
9	10.3	(O)	Santa Rosa Island	86:31:44	30:23:30
10	6.5	(O)	Ft. Walton Beach	86:35:32	30:24:20
11	10.0	(O)	Ft. Walton Beach	86:35:19	30:24:42
12	8.0	(O)	Shalimar	86:35:15	30:26:05
13	7.7	(I)	Shalimar	86:35:15	30:26:05
14	13.0	(O)	N. of Ocean City	86:34:14	30:27:12
15	6.8	(O)	Shalimar	86:35:12	30:26:57

Hurricane Opal - Wind and Water Line Survey

Table 2. Hurricane Opal High Water Mark survey information (continued).

<u>HWM #</u>	<u>Elev. (ft)</u>	<u>Type</u>	<u>Location</u>	<u>Latitude</u>	<u>Longitude</u>
16	7.5	(O)	Eglin Village/Eglin AFB	86:32:43	30:27:11
17	7.8	(O)	Valparaiso	86:29:15	30:31:09
18	9.5	(O)	Destin	86:30:59	30:23:48
19	8.3	(O)	Destin	86:30:11	30:23:18
20	14.3	(I)	Destin	86:27:59	30:23:03
21	21.5	(O)	E. of Miramar Beach	86:24:00	30:22:43
22	20.0	(O)	Miramar Beach	86:21:55	30:22:28
23	15.6	(O)	W. of Miramar Beach	86:20:25	30:22:25
23 a	17.8	(O)	Santa Rosa Beach	86:15:43	30:21:36
24	6.0	(O)	Choctawhatchee Bay	86:15:20	30:29:09
25	20.9	(O)	Blue Mountain Beach	86:12:16	30:20:18
26	10.5	(I)	Grayton Beach	86:10:13	30:19:48
27	12.0	(O)	E. of Seagrove Beach	86:05:51	30:18:46
28	9.7	(O)	W. of Inlet Beach	86:03:42	30:17:42
29	18.6	(O)	Inlet Beach	86:00:47	30:16:29
30	11.0	(O)	Phillips Inlet/Powell Lake	85:59:20	30:16:25
31	10.2	(O)	Phillips Inlet/Powell Lake	85:58:47	30:16:02
32	14.5	(I)	Hollywood Beach	85:58:11	30:15:34
33	7.3	(O)	GIICW/West Bay	85:51:27	30:17:34
34	7.6	(O)	Burnt Mill Cr/West Bay	85:46:00	30:19:40
35	8.2	(O)	Panama City	85:42:01	30:09:59
36	6.0	(O)	Panama City	85:41:28	30:09:52
37	9.2	(O)	Panama City	85:40:10	30:09:32
38	8.5	(O)	Springfield	85:36:58	30:08:05
39	8.4	(O)	Tyndall Air Force Base	85:35:25	30:03:42
40	10.5*	(O)	Panama City Beach	85:44:01	30:07:19
41	7.6	(O)	Davis Beach/Tyndall AFB	85:27:53	29:58:04

* All HWMs are referenced to MSL datum except HWM 40 which is referenced to MLLW.

Hurricane Opal - Wind and Water Line Survey

SUMMARY AND CONCLUSIONS

The Florida counties which had the greatest impact from storm surge effects were Escambia, Santa Rosa, Okaloosa, Walton and Bay Counties, and were the primary survey areas for the wind and water line survey. The preliminary information indicates that more than 3,300 structures were destroyed and over 18,000 damaged by the effects of storm surge and waves along the coastal and bay regions of Alabama and the Florida panhandle.

There were noticeable differences in the HWM elevations for areas located in the wind/wave fetch zone as compared to the areas behind the barrier islands and peninsulas along the bay. The open fetch areas subject to storm surge rise and wind driven waves had much higher HWM elevations, especially along the open coast of the barrier island in the landfall area (Navarre to Ft. Walton Beach) and areas further to the east (as far away as Mexico Beach). The wave runoff component of the coastal flooding was as much as 10 feet higher than the estimated stillwater level on the open coast barrier islands. The shorelines along the north side of the sound or bay behind the barrier islands also had wave runoff with the storm surge rise.

The coastal areas from Destin west to Navarre were overtopped by high storm surge levels resulting in massive loss of the natural dune fields, some 10 to 30 feet high and 100 to 300 feet wide. The erosion of the dune deposited sand inside structures, across roadways and into Santa Rosa Sound. The coastal areas from Destin east to Mexico Beach had severe erosion of the beaches and dunes, and undermining of the oceanfront structures. The dunes were very steep west of Phillips Inlet, and the beaches in and around Panama City Beach were smaller and provided less protection to the upland oceanfront structures. Many destroyed and collapsed structures were observed in this region.

The shorelines along the western side of inland bays also had high waves accompanying the storm surge rise, with evidence of wave runoff up to 5 feet above the estimated stillwater levels. This was evident along the western side of Choctawhatchee Bay where HWM levels of 13 feet were measured, more than 5 feet higher than the other HWM levels in protected areas of the bay. Severe erosion of the bay shoreline was observed in these reaches of the bay, with most of the damages observed inflicted upon docks, boathouses and bulkheads.

MISCELLANEOUS

A collection of photographs of storm damages and impacts are located in Appendix C of this report, and a summary of the survey data collected by Michael Baker Jr., Inc. at each HWM survey location is located in Appendix D (note: not all HWMs were used due to lack of bench mark information or duplicate HWMs at the same location). Detailed information on the HWM survey data collected by the U.S. Army Corps of Engineers and others are not available for this report.

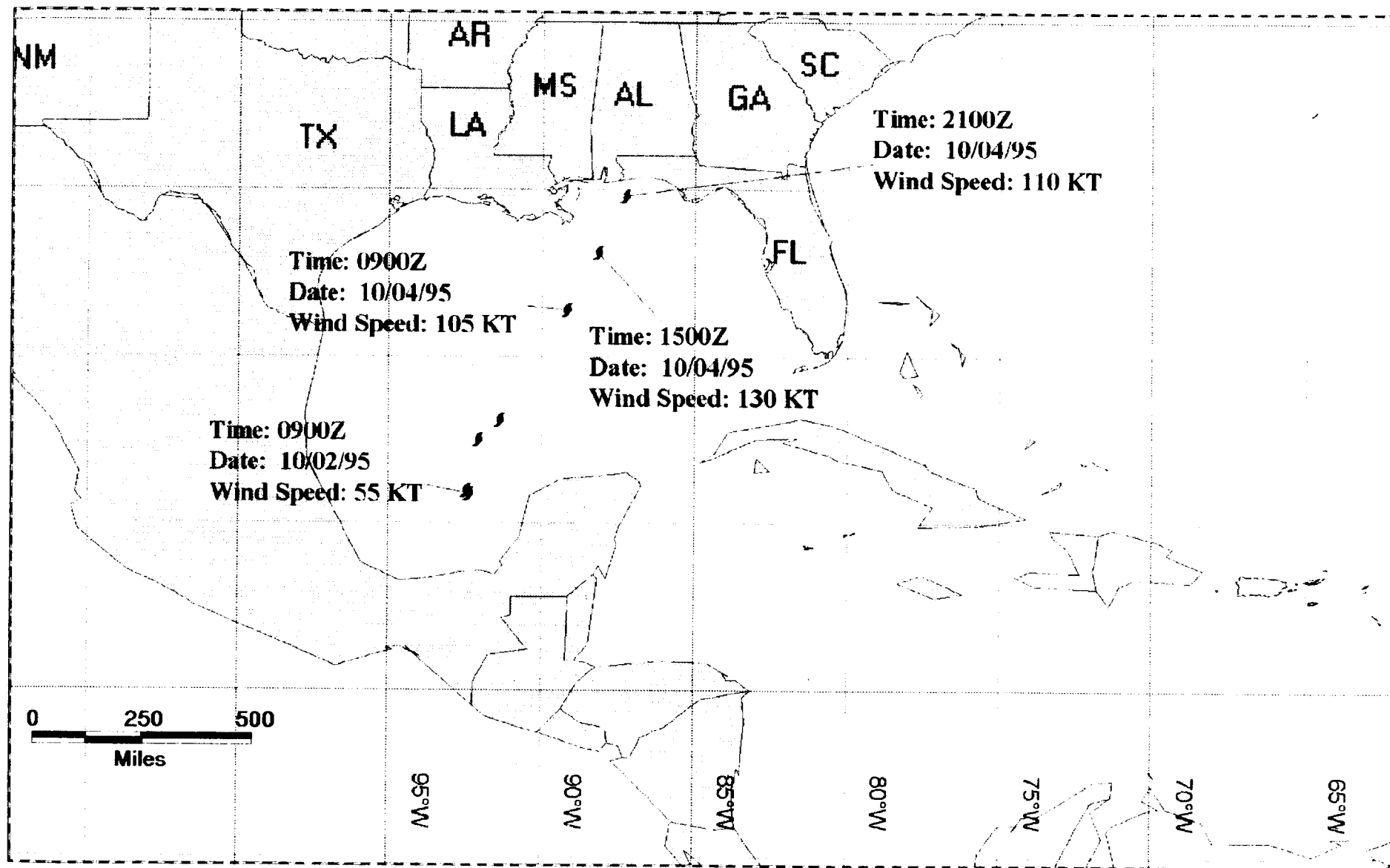
**HURRICANE OPAL - WIND AND WATER LINE
SURVEY**

APPENDIX A

HURRICANE TRACK MAP



Hurricane Opal



◆ Tropical Storm Path

■ Actual Hurricane Position

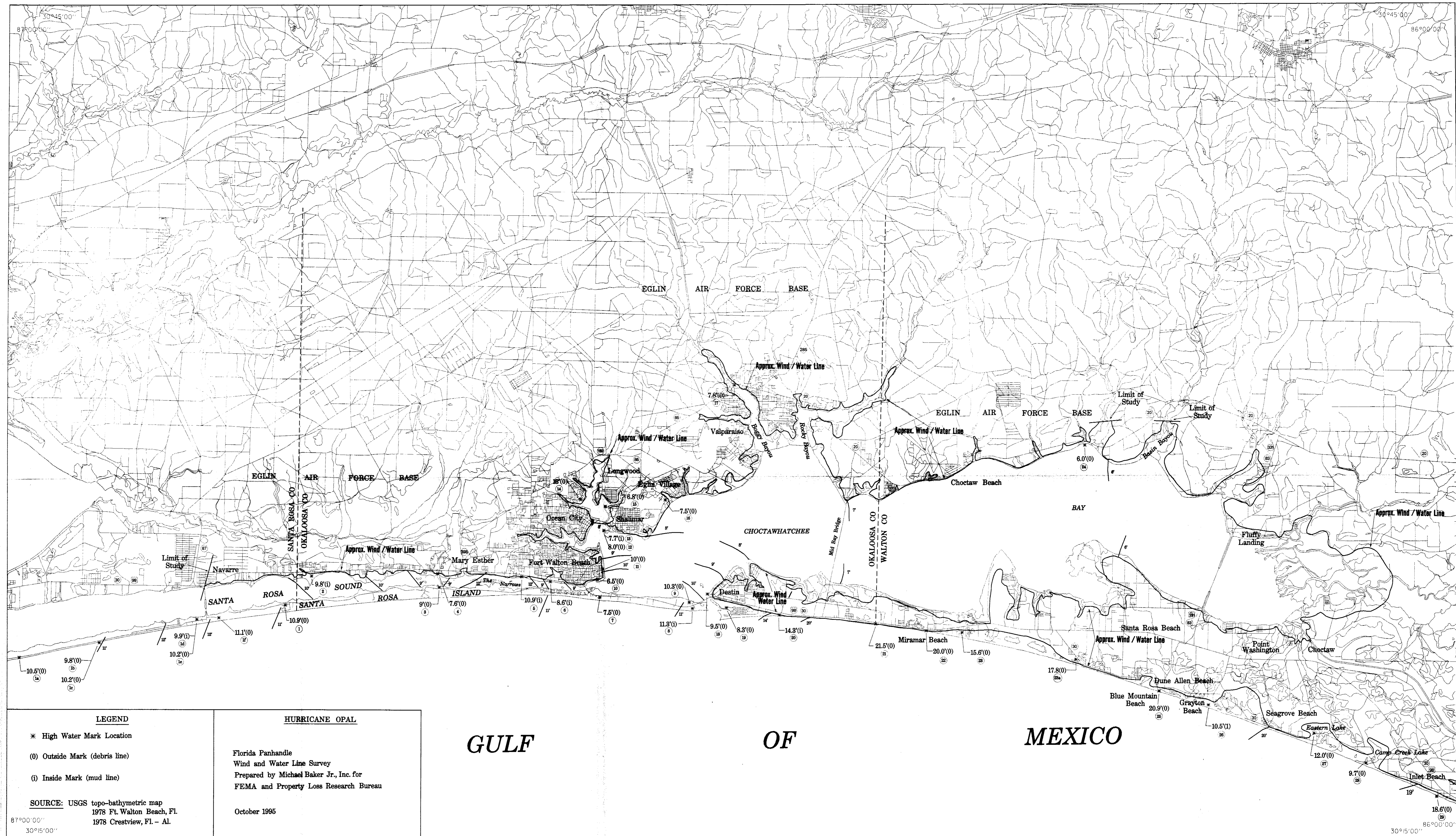
--- Projected Hurricane Path

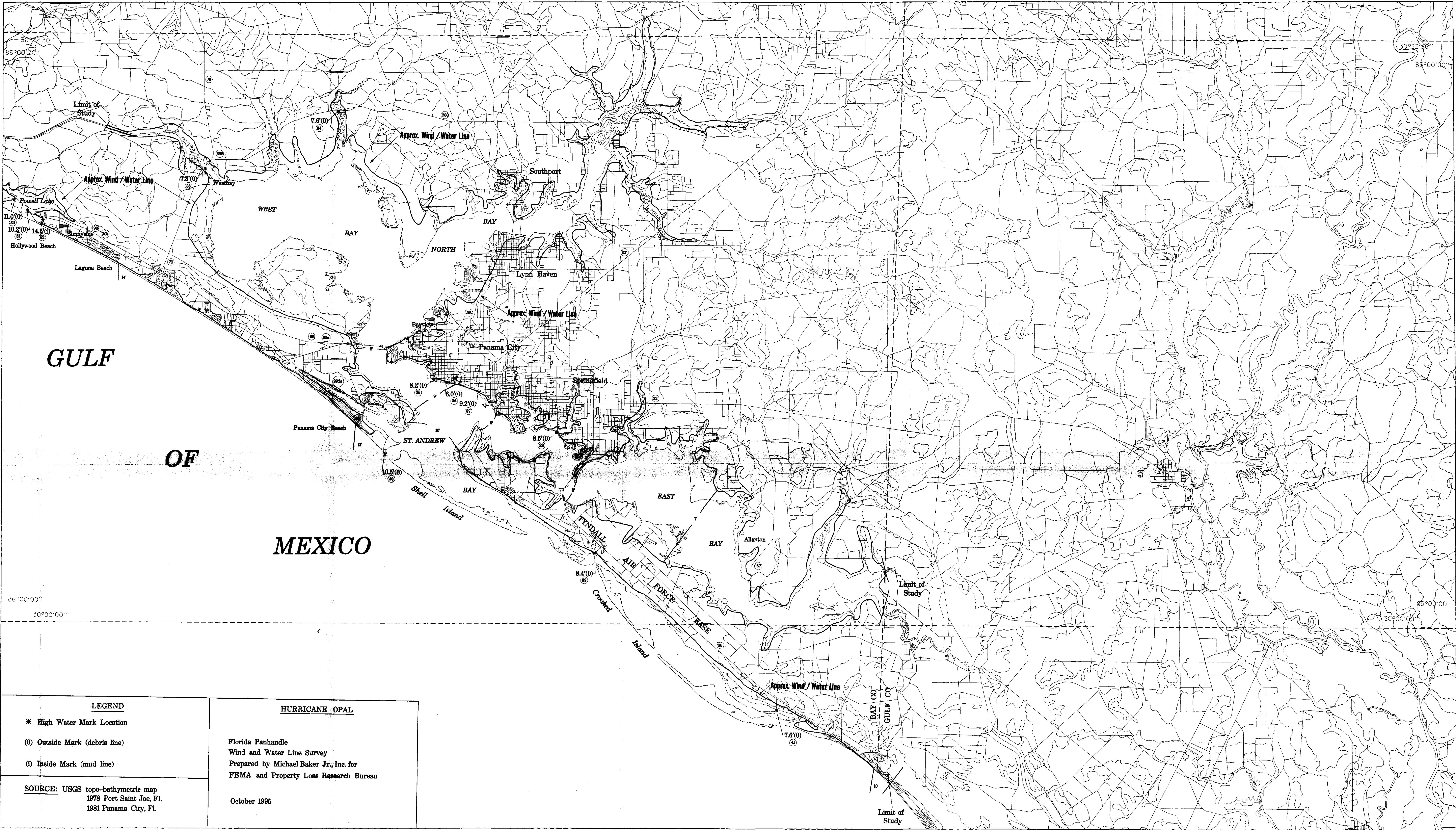
--- Previous Hurricane Path

**HURRICANE OPAL - WIND AND WATER LINE
SURVEY**

APPENDIX B

**HWM LOCATION MAP
AND
APPROX. WIND/WATER LINE
(2 MAPS)**





**HURRICANE OPAL - WIND AND WATER LINE
SURVEY**

APPENDIX C

STORM DAMAGE PHOTOGRAPHS



PHOTO NO. 1 LOCATION MARY ESTER, FL ON
SANTA ROSA SOUND @ EMERALD POINTE SUBDIV.



PHOTO NO. 2 LOCATION MARY ESTER, FL ON
SANTA ROSA SOUND @ 800 BLOCK, MIRACLE STRIP SW.

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 3 LOCATION FT. WALTON
BEACH, FL ON SANTA ROSA SOUND @ EBB TIDE MOTEL



PHOTO NO. 4 LOCATION FT. WALTON BEACH, FL ON
SANTA ROSA SOUND @ EBB TIDE MOTEL, 129 MIRACLE STRIP S.W.

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 5 LOCATION SANTA ROSA IS, FL
ON GULF OF MEXICO @ HOLIDAY INN



PHOTO NO. 6 LOCATION SANTA ROSA ISLAND, FL ON
GULF OF MEXICO @ HOLIDAY INN



PHOTO NO. 7 LOCATION SANTA ROSA ISLAND, FL ON
ON GULF OF MEXICO @ OKALOOSA STATE PARK AND U.S. 98



PHOTO NO. 8 LOCATION SANTA ROSA ISLAND, FL ON
GULF OF MEXICO @ OKALOOSA STATE PARK AND U.S. 98

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 9 LOCATION FORT WALTON BEACH, FL ON
GARNIER Bayou/CHOCTAWHATCHEE BAY @ MOONEY DRIVE



PHOTO NO. 10 LOCATION EGLIN A.F.B. ON CHOCTAWHATCHEE
BAY @ BEN'S LAKE MARINA

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 11 LOCATION CHOCTAW BEACH, FL ON
CHOCTAWHATCHEE Bay ON STATE Hwy 20



PHOTO NO. 12 LOCATION CHOCTAWHATCHEE Bay
AT CLYDE D. WEUS BRIDGE / STATE Hwy 331

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 13 LOCATION MIRAMAR Bch, FL
ON GULF OF MEXICO @ 1600 BLOCK, ALT. U.S. 98



PHOTO NO. 14 LOCATION MIRAMAR BEACH, FL ON
GULF OF MEXICO @ 1600 BLOCK, ALT. U.S. 98



PHOTO NO. 15 LOCATION TANG O'MAR BEACH, FL ON
GULF OF MEXICO @ ALT. U.S. 98



PHOTO NO. 16 LOCATION GRAYTON BEACH, FL ON
GULF OF MEXICO @ ALT. U.S. 98

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 17 LOCATION LAGUNA BEACH, FL ON
GULF OF MEXICO @ ALT. U.S. 98 (SCENIC ROUTE)



PHOTO NO. 18 LOCATION LAGUNA BEACH, FL ON
GULF OF MEXICO @ ALT. U.S. 98 (SCENIC ROUTE)

HURRICANE OPAL - FIELD SURVEY



PHOTO NO. 19 LOCATION PANAMA CITY
BCH, FL ON GULF OF MEXICO @ INT. OF ALT U.S. 98 & U.S. 79



PHOTO NO. 20 LOCATION PANAMA CITY BEACH, FL ON
GULF OF MEXICO @ ALT. U.S. 98 (SCENIC ROUTE)

**HURRICANE OPAL - WIND AND WATER LINE
SURVEY**

APPENDIX D

HWM SURVEY DATA SHEETS

HWM 16

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 1a
Sheet 1 of 2

DATE OF REPORT 10/8/95
REPORTING INDIVIDUAL(S) HATHENAY / KLEENE
ADDRESS AT HWM EGLIN AIR FORCE BASE @ BENS LAKE MARINA
LOCATION DESCRIPTION BENS LAKE MARINA OFF
CHUCKTAWAATCHEE BAY [HWM 1]
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)
INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____
HWM ELEVATION (FEET) 7.76 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 4.0 DATUM _____
SOURCE OF BENCHMARK ELEVATION NATIONAL OCEANOGRAPHIC SURVEY
BENCHMARK LOCATION PK NAIL IN LIGHT POST NEAR
MARINA DOCK
LEVELING METHOD AUTO LEVEL AND PHILLY ROD
OTHER OBSERVATIONS GPS COORDINATES

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM 16

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 16
Sheet 1 of 2

DATE OF REPORT 10/8/95

REPORTING INDIVIDUAL(S) HATHENAY / KLEENE

ADDRESS AT HWM BENS LAKE MARINA / EGLIN AFB

LOCATION DESCRIPTION MARINA ON BENS LAKE OFF OF
CHOCKTAW HATCHEE BAY [HWM 2]

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____

HWM ELEVATION (FEET) 7.99 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM NGVD

BENCHMARK ELEVATION (FEET) 4.0 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION NATIONAL OCEANOGRAPHIC SURVEY

BENCHMARK LOCATION PK NAIL IN LIGHT POST NEAR MARINA
DOCK FLAGGED WITH ORANGE RIBBON

LEVELING METHOD AUTO LEVEL AND PHILLY ROD

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

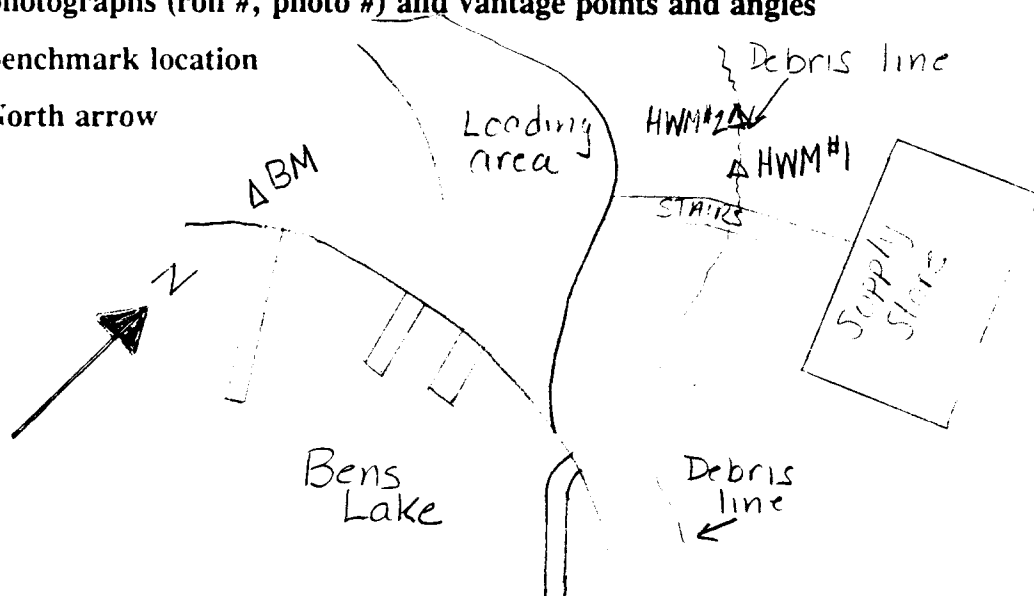
HWM 16

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 1a & b

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



PLAN

ELEVATION

HWM 13

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 29
Sheet 1 of 2

DATE OF REPORT 10/8/95

REPORTING INDIVIDUAL(S) D HATHENY / W KLEENE

ADDRESS AT HWM 200 OLD FERRY RD

LOCATION DESCRIPTION INSIDE MARK ON HOUSE LOCATED NEAR
MARINA ON OLD FERRY ROAD [HWM 3]

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE X MUD LINE X MARK ON FIXED
OUTSIDE _____ DEBRIS LINE _____ STRUCTURE X

HWM ELEVATION (FEET) 7.72 DATUM NGVD

GROUND ELEVATION (FEET) 5.60 DATUM NGVD

BENCHMARK ELEVATION (FEET) 7.0 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION PRIOR PROPERTY SURVEY

BENCHMARK LOCATION ELEVATION MARK (7 Ft) ON MARINA
BUILDING WALL

LEVELING METHOD AUTO LEVEL AND PHILLY ROD

OTHER OBSERVATIONS GPS COORDINATES N30°26.12 W086°35.10

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 26

Sheet 1 of 2

HWM 12

DATE OF REPORT 10/8/95

REPORTING INDIVIDUAL(S) D. HATHEWAY / W. KLEENE

ADDRESS AT HWM OLD FERRY RD MARINA

LOCATION DESCRIPTION MARK LOCATED ON EAST WALL OF MARINA

BUILDING [HWM 4]

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE X

MARK ON FIXED

OUTSIDE X

DEBRIS LINE _____

STRUCTURE X

HWM ELEVATION (FEET) 7.95 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 7.0 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION PROPERTY SURVEY

BENCHMARK LOCATION ELEVATION MARK (7 ft) ON MARINA

WALL

LEVELING METHOD AUTO LEVEL AND PHILLY ROD

OTHER OBSERVATIONS GPS COORDINATES N30°26.1 W86°35.1

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

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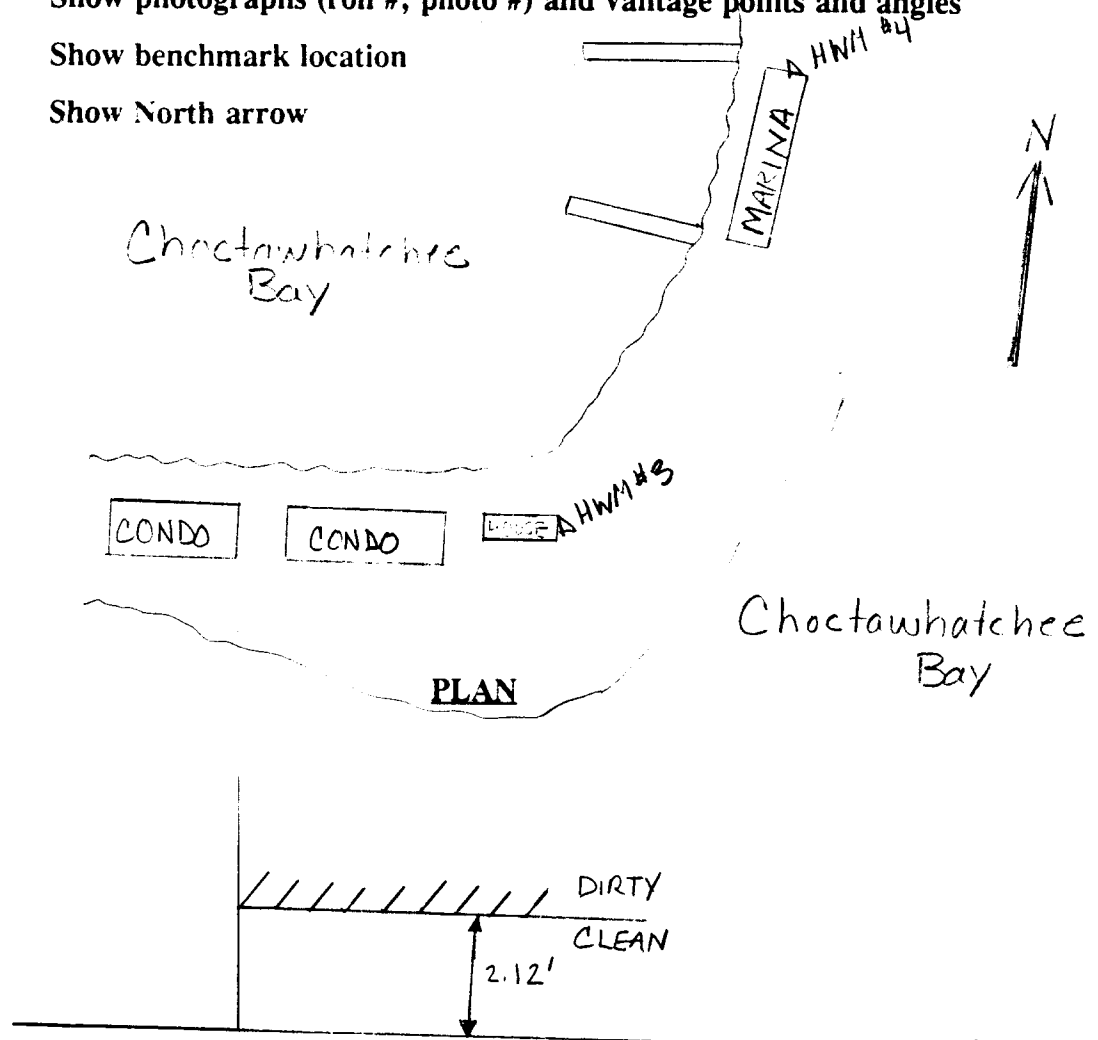
HWM 12 $\frac{1}{2}$ 13

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 2a $\frac{1}{2}$ b

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



ELEVATION

HWM 15

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 3

Sheet 1 of 2

DATE OF REPORT 10/8/95

REPORTING INDIVIDUAL(S) D. HATHEWAY / W. KLEENE

ADDRESS AT HWM RICHBURG ST. AND CARL BRANDT DR. INTERSECTION

LOCATION DESCRIPTION DEBRIS LINE NW OF CARL BRANDT DR NEAR
BRICK FENCE [HWM 5]

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE SE

HWM ELEVATION (FEET) 6.83 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 15.81 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION NOS

BENCHMARK LOCATION Q297 ON RICHBURG STREET, BRASS
PLATE NEAR UTILITY POLE

LEVELING METHOD AUTO LEVEL AND PHILLY ROD

OTHER OBSERVATIONS GPS COORDINATES N30°26.9' W 86°34.1'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

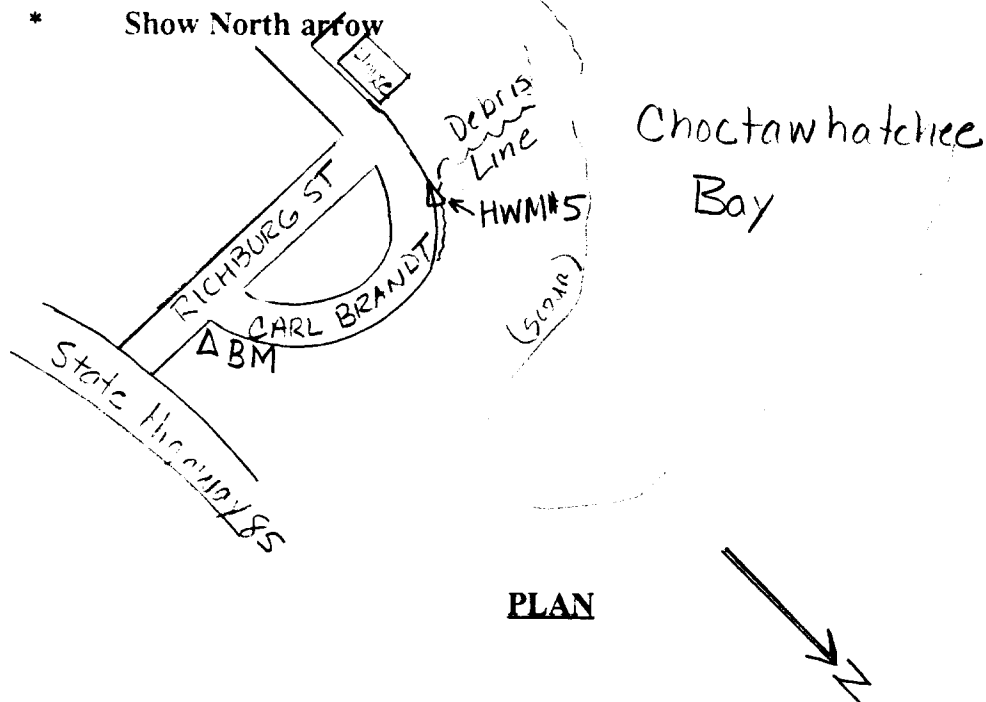
HWM 15

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 3

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



ELEVATION

HWM 14

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 4

Sheet 1 of 2

DATE OF REPORT 10/8/95

REPORTING INDIVIDUAL(S) D. HATHENWAY / W. KLEENE

ADDRESS AT HWM 132 Troy Circle, Ft. Walton Beach

LOCATION DESCRIPTION NW Chocktawatchee Bay @ Garnier

Bayou [HWM 6]

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 13.08 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 0.5 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION Water level calculated from HWM5 survey

BENCHMARK LOCATION _____

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS GPS coordinates N30°27.2' W86°36.1'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

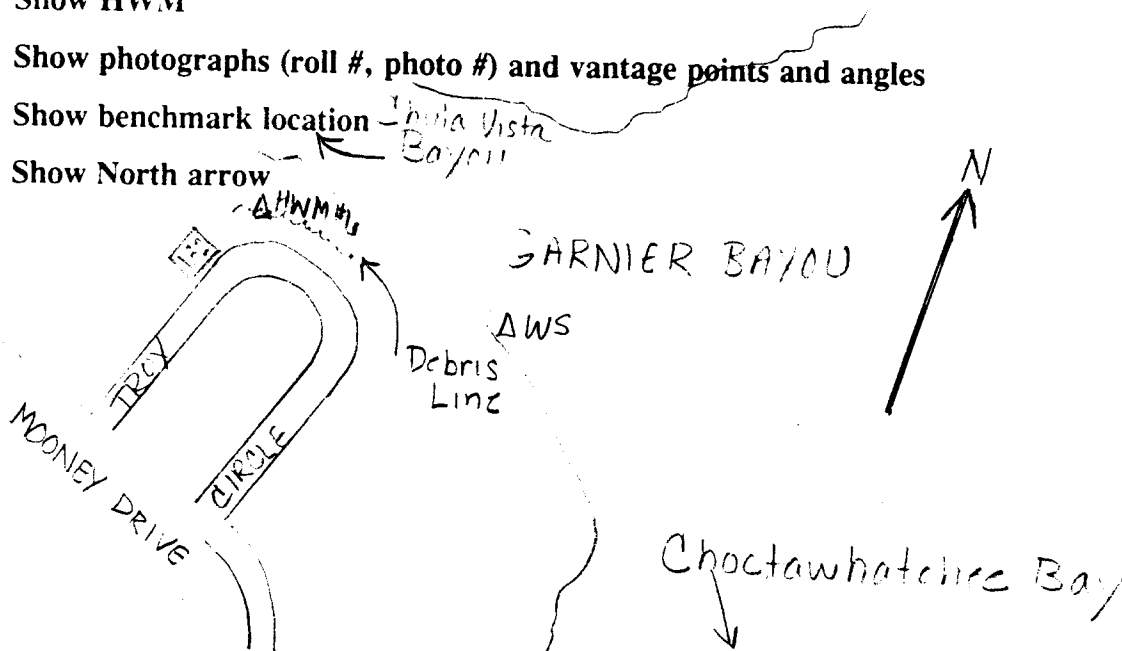
HWM 14

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 4

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location - Julia Vista Bayou
- * Show North arrow



PLAN

ELEVATION

HWM 5

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 5a

Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D Hatheway / W Kleene

ADDRESS AT HWM 849 Miracle Strip, Mary Ester, Fla

LOCATION DESCRIPTION HWM 7 is in the bedroom closet in the back of the house

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE X

MUD LINE X

MARK ON FIXED

OUTSIDE _____

DEBRIS LINE _____

STRUCTURE X

HWM ELEVATION (FEET) 10.895 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 15.197 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION Coast & Geodetic Survey - C180-1957

BENCHMARK LOCATION along ^{So. side of} US 98 (Miracle Strip) adjacent to 849 Miracle Strip

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS near Santa Rosa Sound

GPS @ benchmark N 30° 24.49' W 86° 38.56'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 56

Sheet 1 of 2

DATE OF REPORT 10/13/95
REPORTING INDIVIDUAL(S) D. Hatheway / W. Kleene
ADDRESS AT HWM 849 Miracle Strip, Mary Ester, Fla
LOCATION DESCRIPTION Hwm is along the back wall (stucco)
of the house @ 849 Miracle Strip
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)
INSIDE _____ MUD LINE X MARK ON FIXED
OUTSIDE X DEBRIS LINE _____ STRUCTURE X
HWM ELEVATION (FEET) 10.572 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 15.197 DATUM NGVD
SOURCE OF BENCHMARK ELEVATION Coastal Geodetic Survey - C180-1957
BENCHMARK LOCATION along South side of US98/Miracle
Strip adjacent to 849 Miracle Strip
LEVELING METHOD Auto level and philly rod
OTHER OBSERVATIONS near Santa Rosa Sound.
GPS @ benchmark N30°24.49' W86°38.56'
PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

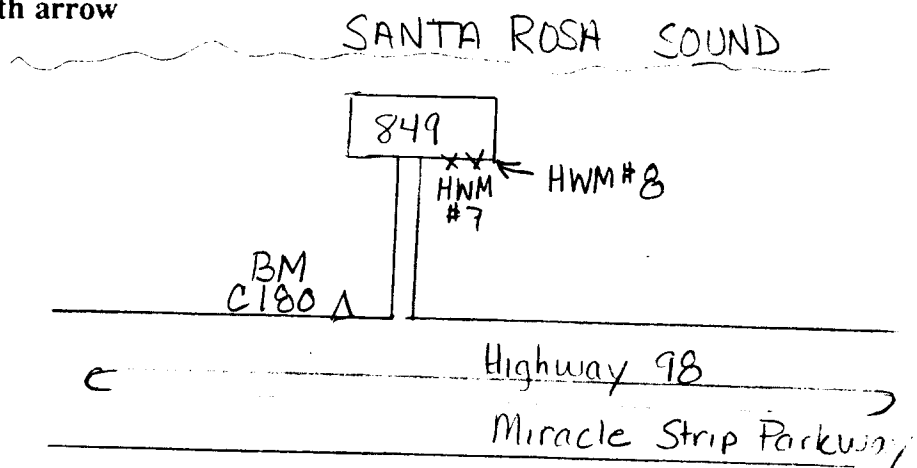
MICHAEL BAKER JR., INC.

HWM 5

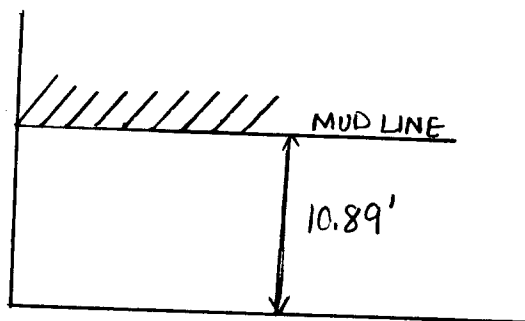
HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 5a & b
Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



PLAN



ELEVATION

HWM 6

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 6

Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D. Hatheway / W. Kleene

ADDRESS AT HWM 128 Miracle Strip, SW

LOCATION DESCRIPTION inside office of Ebb Tide Motel
(HWM 19)

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE X

MUD LINE X

MARK ON FIXED

OUTSIDE _____

DEBRIS LINE _____

STRUCTURE X

HWM ELEVATION (FEET) 8.628 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 3.678 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION NGS J297-1967

BENCHMARK LOCATION Disk in headwall along the
North side of US 98

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS near Santa Rosa Sound.

GPS reading @ BM N30°24.31' W 86°37.33'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

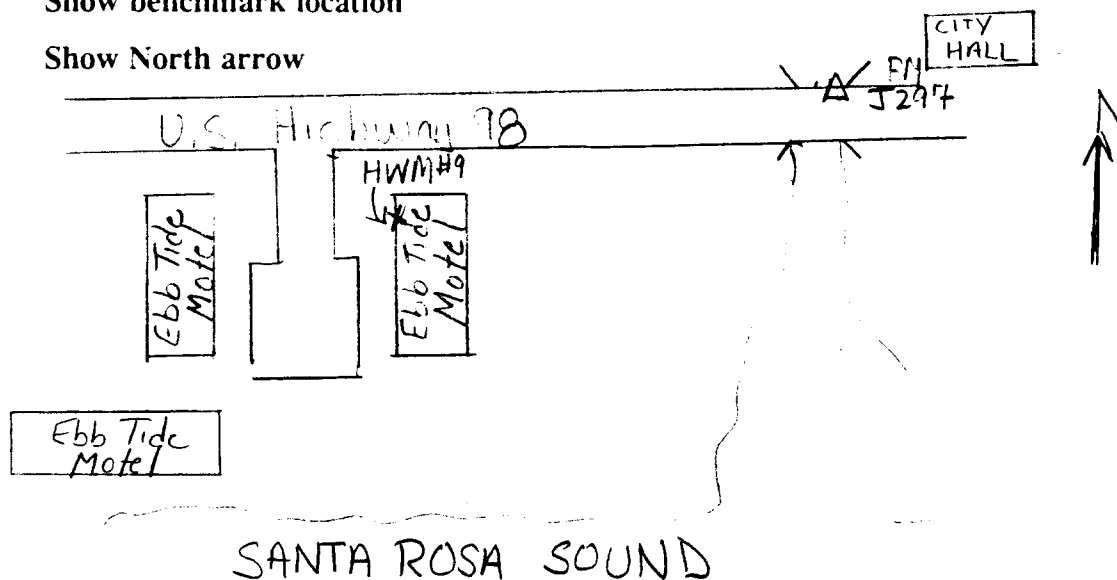
MICHAEL BAKER JR., INC.

HWM 6

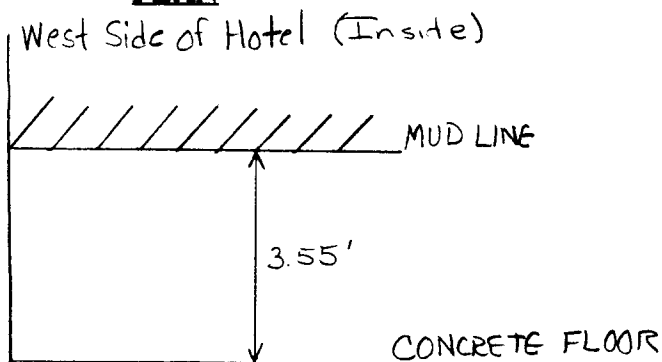
HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 6
Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



PLAN



ELEVATION

MICHAEL BAKER JR., INC.

HWM 10

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 7
Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D Hatheway / W. Kleene

ADDRESS AT HWM Waikridge Road

LOCATION DESCRIPTION Backside of house on garage door [HWM 10]

DATE OF HWM OCCURRENCE 10/4/95 TIME

DURATION OF OCCURRENCE

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE

MUD LINE X

MARK ON FIXED

OUTSIDE X

DEBRIS LINE

STRUCTURE X

HWM ELEVATION (FEET) ~6 DATUM NGVD

GROUND ELEVATION (FEET) DATUM

BENCHMARK ELEVATION (FEET) ~6.5 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION spot elevation from USGS Quad

BENCHMARK LOCATION intersection of Waikridge Road and Brooks St.

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS near Chocktawhatchee Bay
GPS reading @ bm N30°24.33' W86°35.41'

PHOTOGRAPHS: (ROLL # , PHOTO #)

(ROLL # , PHOTO #)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

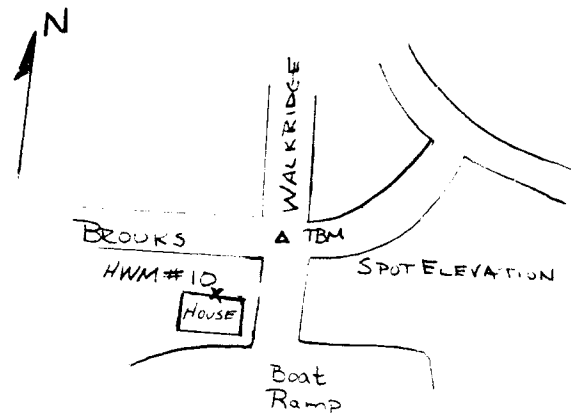
HWM 10

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

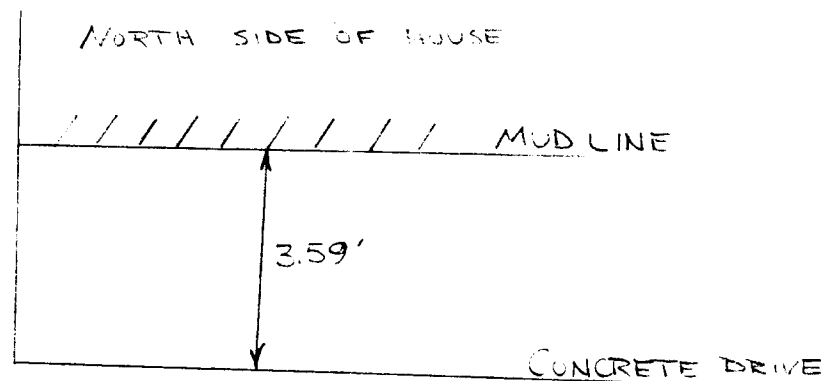
Report # 7

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



Chocktawhatchee Bay
PLAN



ELEVATION

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 8 a

Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D. Hatheway / W. Keene

ADDRESS AT HWM SE end of US85 bridge, Valpariso

LOCATION DESCRIPTION HWM 12 is on the north side of the lounge along US85 east of Boggy Bayou

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE X

HWM ELEVATION (FEET) 7.227 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 8.067 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION FLHD V292

BENCHMARK LOCATION East of Boggy Bayou on the South side of US85

LEVELING METHOD Auto level and Philly rod

OTHER OBSERVATIONS GPS rdg @ BM N30°31.39' W86°29.90'
North of Choctawhatchee Bay

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM 17

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 86
Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D Hatheway / W Kleene

ADDRESS AT HWM SE end of US85 bridge, Valpariso

LOCATION DESCRIPTION HWM13 is on the north side of the
lounge along US85 east of Boggy Bayou

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE X

HWM ELEVATION (FEET) 7.847 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 8.067 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION FLHD V292

BENCHMARK LOCATION east of Boggy Bayou on the
south side of US85

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS GPS rdg @ BM N30°31.39' W86°29.90'
North of Choctawachee Bay

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

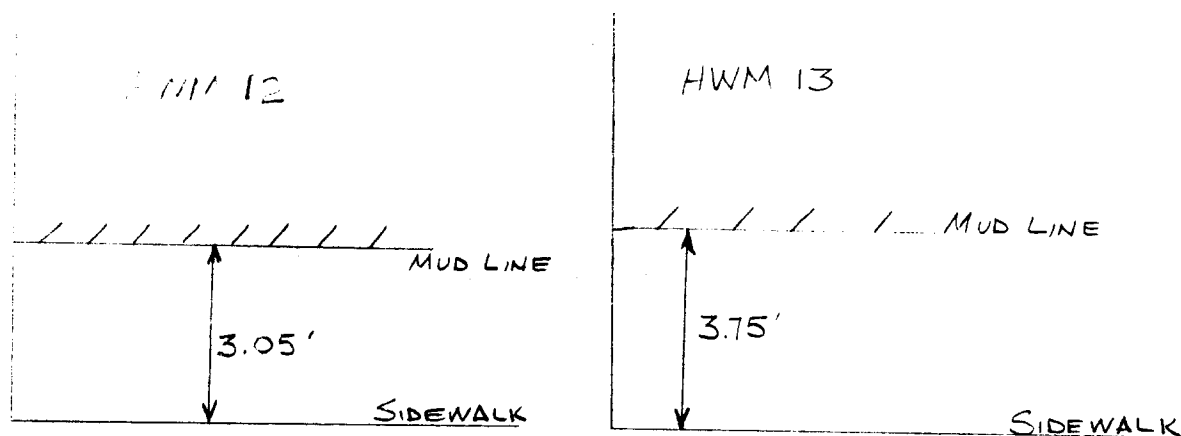
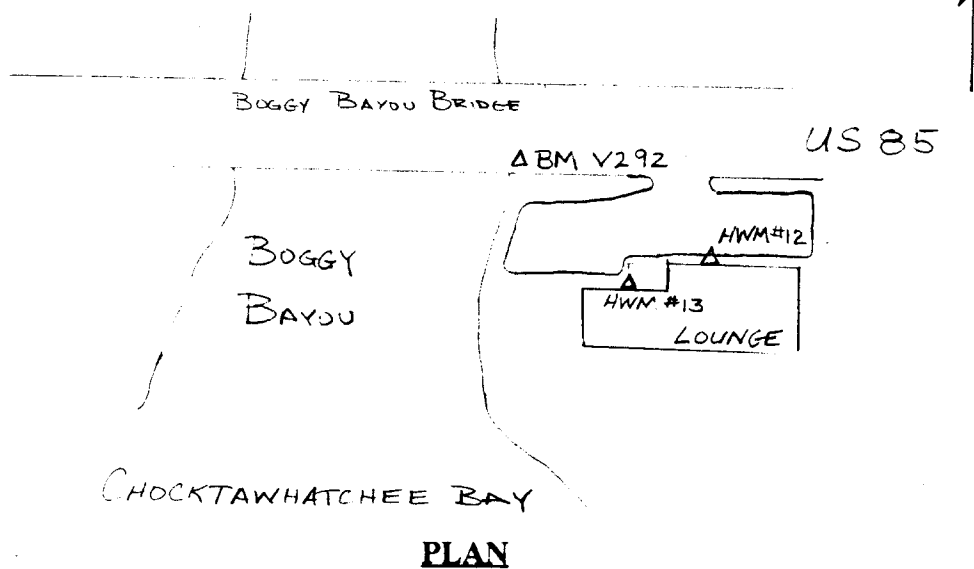
HWM 17

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 8a4b

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



ELEVATION

HWM 11

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 9
Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) D Hatheway / W Kleene

ADDRESS AT HWM Bay Dr NE

LOCATION DESCRIPTION HWM 11 is 2 houses south of the intersection of Hollywood Dr & Bay Dr N.E.

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____

HWM ELEVATION (FEET) ~10 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) ~10 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION spot elev. from USGS quad

BENCHMARK LOCATION sewer manhole cover at the intersection of Hollywood Dr. & Bay Dr.

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS scour & damage to docks. GPS rdg: N30°24.70' W86°35.31'. Surge & wave runup

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

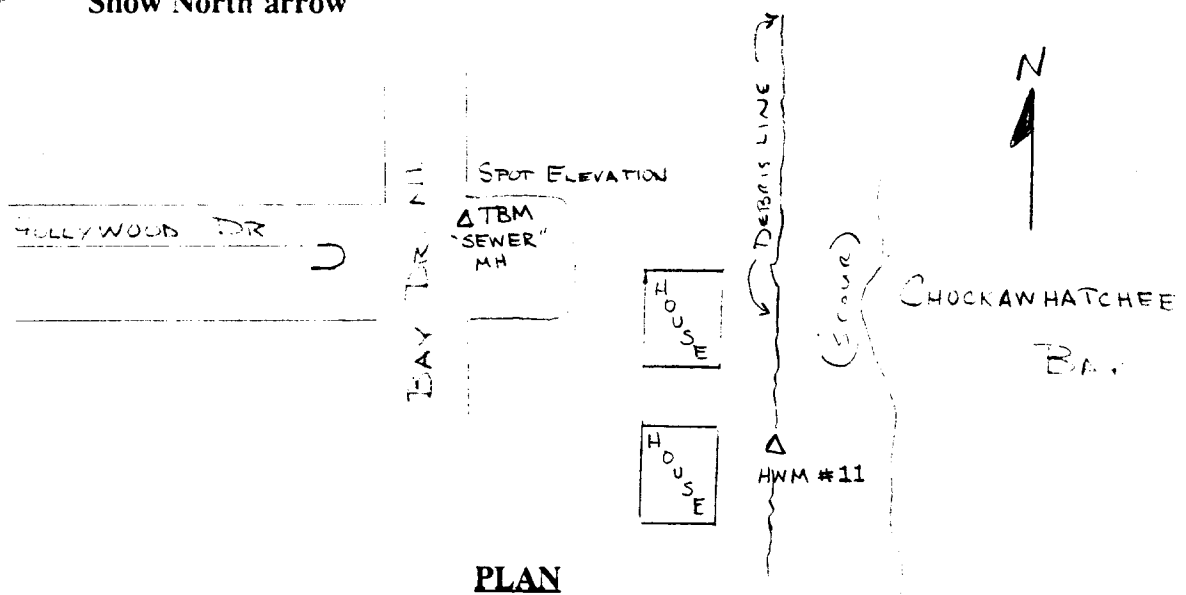
MICHAEL BAKER JR., INC.

HWM 11

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 9
Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



ELEVATION

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 10 a

Sheet 1 of 2

DATE OF REPORT 10/12/95

REPORTING INDIVIDUAL(S) M. PIRRELLA / P. SEXTON

ADDRESS AT HWM East Bay - Dupont Bridge

LOCATION DESCRIPTION Pt. 1 is approx 150 feet NE of NE corner of the old Dupont Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 6.43 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 14.1 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Army Corps of Engineers - BM#4

BENCHMARK LOCATION NE corner of the old Dupont Bridge.

brass plate on wingwall

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS GPS coordinates N 30° 06.3' W 85° 36.2'

Slight erosion along banks of East Bay.

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 106

Sheet 1 of 2

DATE OF REPORT 10/12/95

REPORTING INDIVIDUAL(S) M. PIRRELLA / P. SEXTON

ADDRESS AT HWM East Bay - Dupont Bridge

LOCATION DESCRIPTION Pt. 2 is approx. 100 feet SE
of NE corner of the old Dupont Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 6.65 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 14.10 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Army Corps of Engineers - B.M.#.

BENCHMARK LOCATION NE corner of the old Dupont
Bridge, brass plate on wingwall

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 10 c

Sheet 1 of 2

DATE OF REPORT 10/12/95

REPORTING INDIVIDUAL(S) M. PIRRELLA / P. SEXTON

ADDRESS AT HWM East Bay - Dupont Bridge

LOCATION DESCRIPTION Pl. 3 is approx. 120 feet SE of the NE corner of the old Dupont Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____ MUD LINE _____ MARK ON FIXED

OUTSIDE X DEBRIS LINE X STRUCTURE _____

HWM ELEVATION (FEET) 6.65 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 14.10 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Army Corps of Engineers - BM #2

BENCHMARK LOCATION NE corner of the old Dupont Bridge, brass plate on wingwall

LEVELING METHOD Auto level and Philly rod

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

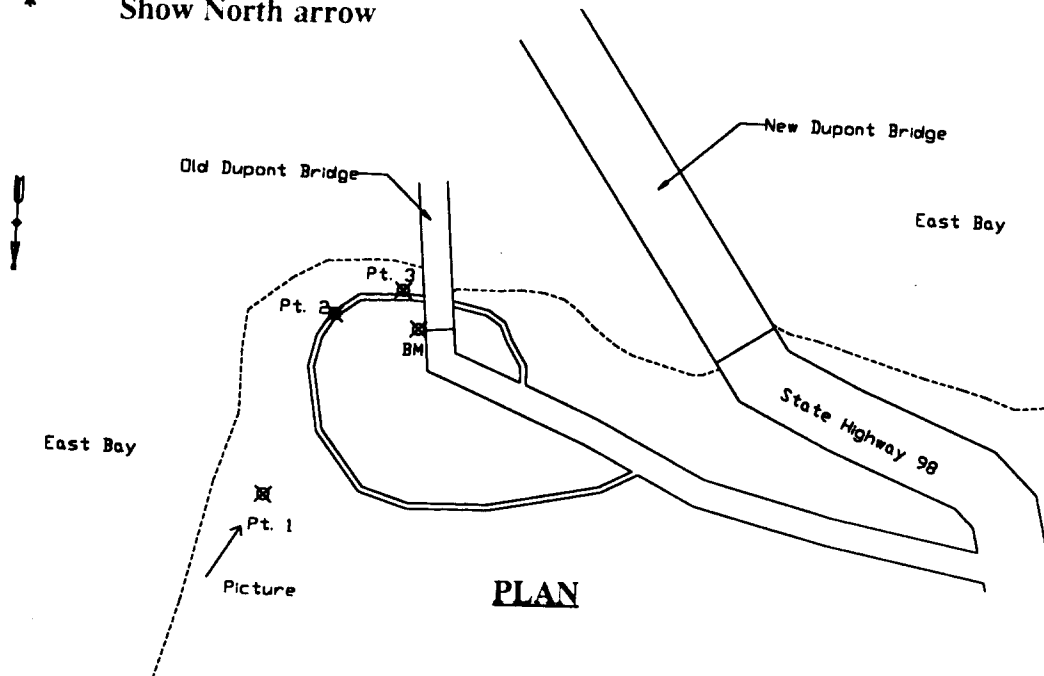
MICHAEL BAKER JR., INC.

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 10 a, b & c

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



ELEVATION

HWM 2

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 11
Sheet 1 of 2

DATE OF REPORT 10/8/95
REPORTING INDIVIDUAL(S) D Hatheway / W Kleene
ADDRESS AT HWM Emerald Point Drive
LOCATION DESCRIPTION HWM 25 off of Emerald Point Drive
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)
INSIDE X MUD LINE X MARK ON FIXED
OUTSIDE _____ DEBRIS LINE _____ STRUCTURE X
HWM ELEVATION (FEET) 9.76 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 13.215 DATUM NGVD
SOURCE OF BENCHMARK ELEVATION NGS W298
BENCHMARK LOCATION W298 Located on U.S 98 near Emerald Point Subdivision
LEVELING METHOD Auto level and philly rod
OTHER OBSERVATIONS GPS coordinates of BM
N 30° 24.6' W 86° 47.3'
PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

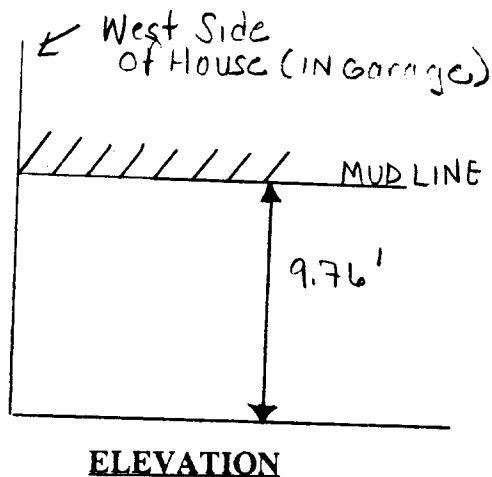
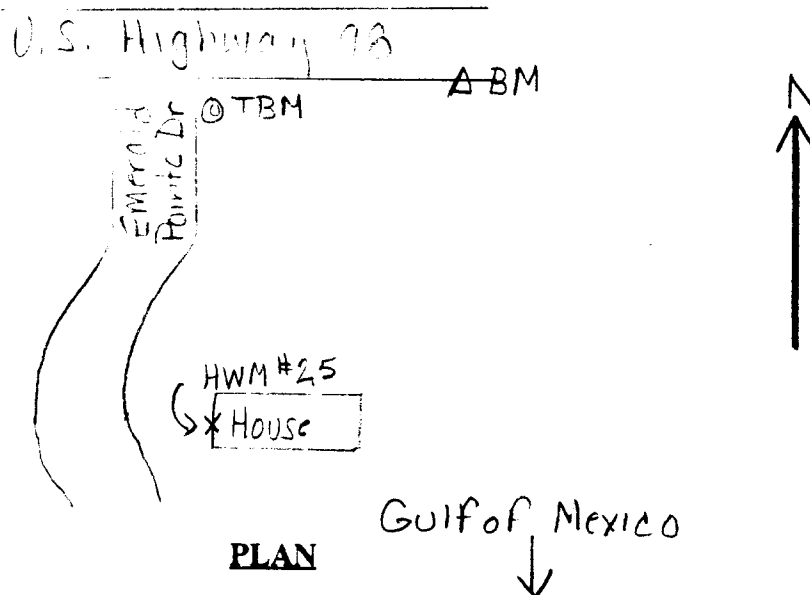
Hwm 2

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 11

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow



HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 12a

Sheet 1 of 2

DATE OF REPORT 10/12/95REPORTING INDIVIDUAL(S) M. PIRRELLO / P. SEXTONADDRESS AT HWM Corner of Frankford and Beach DriveLOCATION DESCRIPTION Pt. 1 is approx. 30 feet northeast
of corner of Frankford and Beach DriveDATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE XDEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 5.77 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 5.95 DATUM NGVDSOURCE OF BENCHMARK ELEVATION U.S. Coast and Geodetic Survey - RM 175BENCHMARK LOCATION SE corner of the intersection of
Frankford and Beach DriveLEVELING METHOD Auto level and Philly rodOTHER OBSERVATIONS GPS coordinates for BM - N 30° 02.9', W 55° 41.5'
Heavy debris line consisting of timber, trees, and shrubs

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM —

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 126
Sheet 1 of 2

DATE OF REPORT 10/12/95

REPORTING INDIVIDUAL(S) M. PIRRELLA / P. SEXTON

ADDRESS AT HWM Corner of Frankford and Beach Drive

LOCATION DESCRIPTION Pt. 2 is 40 feet northeast of corner of Frankford and Beach Drive

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____	MUD LINE _____	MARK ON FIXED _____
OUTSIDE <u>X</u>	DEBRIS LINE <u>X</u>	STRUCTURE _____

HWM ELEVATION (FEET) 6.18 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 5.95 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Coast and Geodetic Survey - RM 175

BENCHMARK LOCATION SE corner of the intersection of Frankford and Beach Drive

LEVELING METHOD Auto level

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

14wm 36

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 12 a46

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

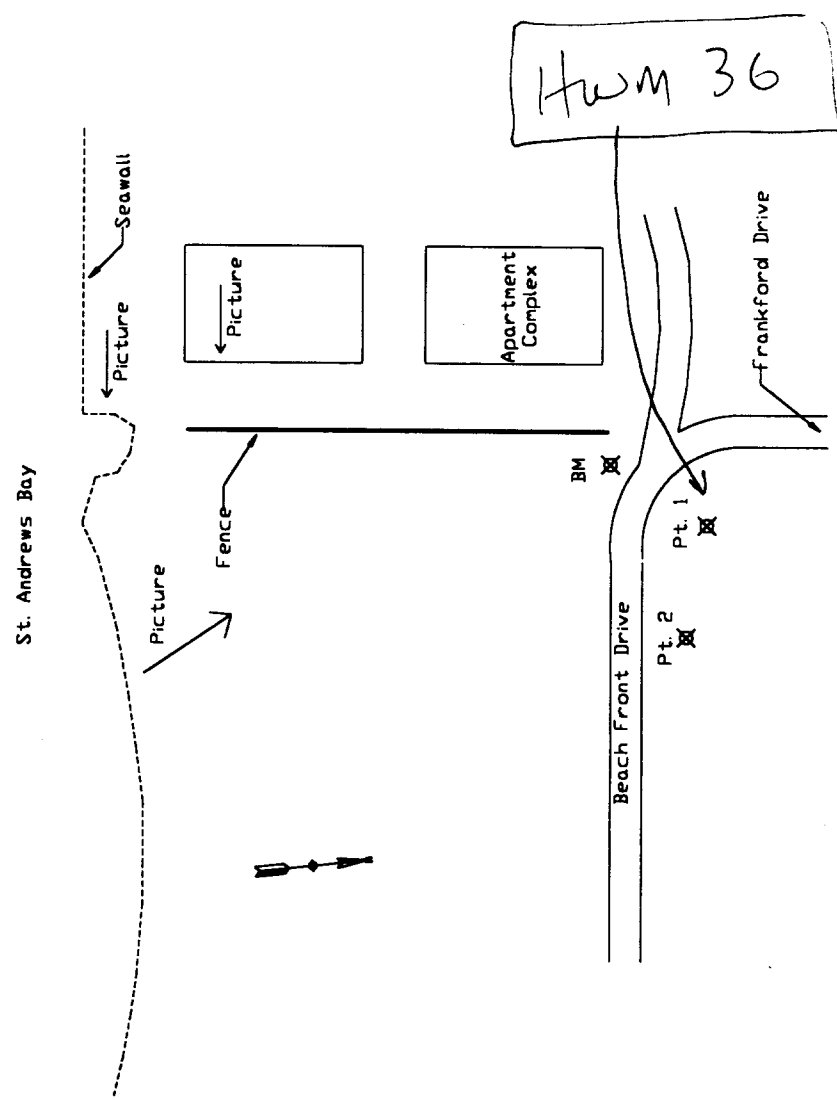
(see attached)

PLAN

ELEVATION

MICHAEL BAKER JR., INC.

12 a & b



HWM 35

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 13

Sheet 1 of 2

DATE OF REPORT 10/12/95REPORTING INDIVIDUAL(S) III. PIRRELLO / P. SEXTONADDRESS AT HWM 2629 9th StreetLOCATION DESCRIPTION 150' SW of the corner of 9th Street
and Chestnut StreetDATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____ MUD LINE _____ MARK ON FIXED

OUTSIDE X DEBRIS LINE X STRUCTURE _____HWM ELEVATION (FEET) 8.22 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 12.91 DATUM NGVDSOURCE OF BENCHMARK ELEVATION National Geodetic Survey R42BENCHMARK LOCATION NE corner of 9th Street and
Chestnut StreetLEVELING METHOD Auto level and stumpy rodOTHER OBSERVATIONS GPS coordinates for B.M. N 30° 10.0' N 85° 42.0'
Heavy debris line (nearly 1.5' high) of trees and shrubs

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM 35

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 13

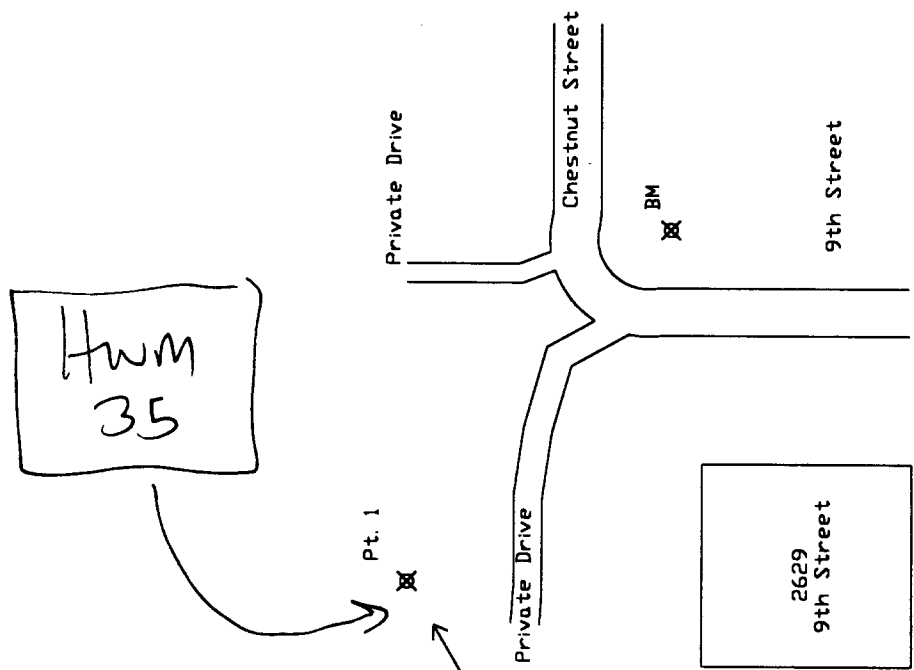
Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

(see attached)

PLAN

ELEVATION



St. Andrews Bay

HWM 24

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 14
Sheet 1 of 2

DATE OF REPORT 10/12/95

REPORTING INDIVIDUAL(S) M. PIRRELLI / P. SEXTON

ADDRESS AT HWM State Highway 20 at Basin Bayou

LOCATION DESCRIPTION Pt. 1 is approx 50 feet west of the
SW corner of Basin Bayou Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____

HWM ELEVATION (FEET) 5.98 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 10.53 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION Natural Geodetic Survey #3-1975

BENCHMARK LOCATION SW corner of Basin Bayou Bridge,
atop concrete bridge railing

LEVELING METHOD Auto level and plumb line

OTHER OBSERVATIONS GPS coordinates for Pt 1 30°29.2'N, 86°15.0'W
Debris line of shrubs, eroded soil and dead grass also noted

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

Hwm 24

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 14

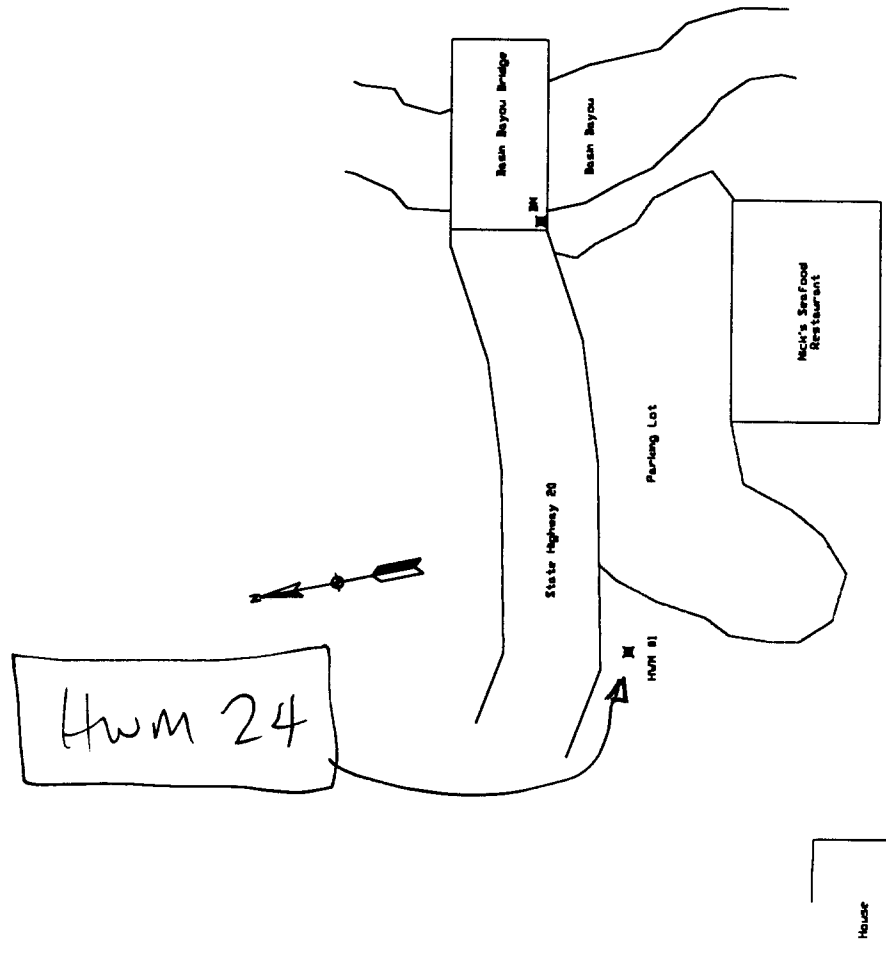
Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

(see attached)

PLAN

ELEVATION



HWM 23

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 15 a
Sheet 1 of 2

DATE OF REPORT 10/13/95
REPORTING INDIVIDUAL(S) M. PIRRELLO / P. SEXTON
ADDRESS AT HWM State Highway 79 over West Bay
LOCATION DESCRIPTION Pt. 115 approx 30 feet SE of the SE
corner of the old State Highway 79 Bridge.
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____	MUD LINE _____	MARK ON FIXED
OUTSIDE <u>X</u>	DEBRIS LINE <u>X</u>	STRUCTURE _____

HWM ELEVATION (FEET) 7.2 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 11.78 DATUM NGVD
SOURCE OF BENCHMARK ELEVATION National Oceanic Survey - 1975, BM #6
BENCHMARK LOCATION SE corner of the old (abandoned)
State Highway 79 Bridge, on concrete wingwall
LEVELING METHOD Auto level and Philly rod
OTHER OBSERVATIONS CAPS coordinates - N 30° 17.6' W 85° 57.5'
Debris line consisted of weeds, shrubs, and tree branches
PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

Hwm 23

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 156
Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) M. PIRRELLO / P. SEXTON

ADDRESS AT HWM State Highway 79 over West Bay

LOCATION DESCRIPTION Pt. 2 is approx 50 feet SE of the SE corner of the old State Highway 79 Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 7.34 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 11.78 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION National Oceanic Survey - 1975

BENCHMARK LOCATION SE corner of the old (abandoned)

State Highway 79 Bridge, on concrete wingwall

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM 23

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 15 a & b
Sheet 2 of 2

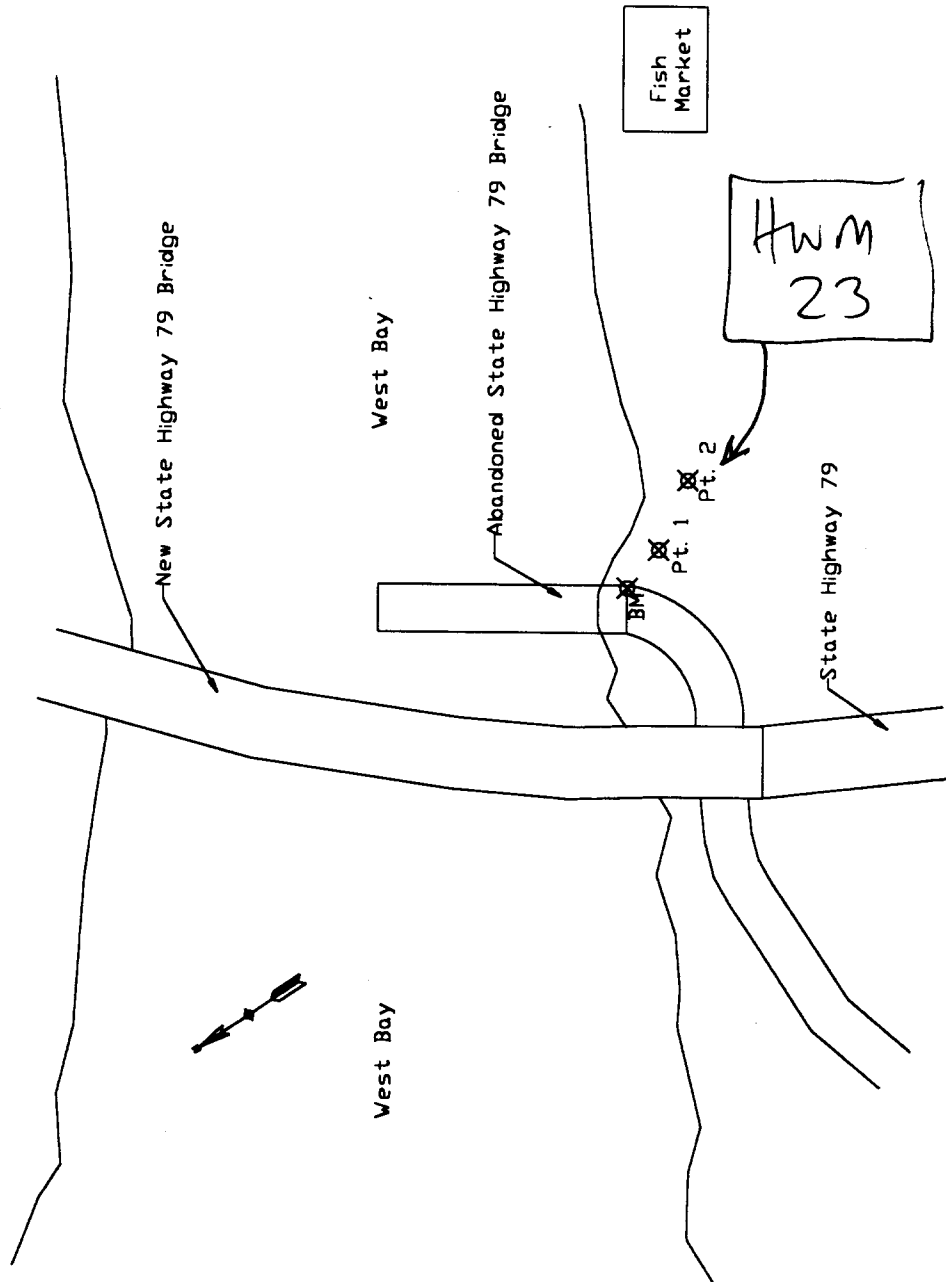
- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

(See attached)

PLAN

ELEVATION

15 a & b



Hwm ~~3~~

HURRICANE OPAL

HIGH WATER MARK (HWM) REPORT

Report # 16 a

Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) M. PIRKELLO / P. SEXTON

ADDRESS AT HWM North Bay Bridge - State Highway 77

LOCATION DESCRIPTION Approx 40 feet from NW corner of
North Bay Bridge - Pt. 1

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 7.60 DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 9.03 DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Coast and Geodetic Survey-7290

BENCHMARK LOCATION NE corner of North Bay Bridge, on
bridge abutment

LEVELING METHOD Auto level and plumb line

OTHER OBSERVATIONS GPS coordinates N 30° 15.7' W 55° 38.7'
Light and scattered debris line

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 166
Sheet 1 of 2

DATE OF REPORT 10/13/95

REPORTING INDIVIDUAL(S) M. PIRRELLA / P. SEXTON

ADDRESS AT HWM North Bay Bridge - State Highway 77

LOCATION DESCRIPTION Pt. 2 is approx. 70 feet from NW corner of North Bay Bridge

DATE OF HWM OCCURRENCE 10/4/95 TIME _____

DURATION OF OCCURRENCE _____

TYPE OF MARK (CHECK ALL THAT APPLY)

INSIDE _____

MUD LINE _____

MARK ON FIXED

OUTSIDE X

DEBRIS LINE X

STRUCTURE _____

HWM ELEVATION (FEET) 2.19' DATUM NGVD

GROUND ELEVATION (FEET) _____ DATUM _____

BENCHMARK ELEVATION (FEET) 9.03' DATUM NGVD

SOURCE OF BENCHMARK ELEVATION U.S. Coast and Geodetic Survey - Y290

BENCHMARK LOCATION NE corner of North Bay Bridge, on bridge abutment

LEVELING METHOD Auto level and philly rod

OTHER OBSERVATIONS _____

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)

(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

Hwm 3~~4~~

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 16 a & b
Sheet 2 of 2

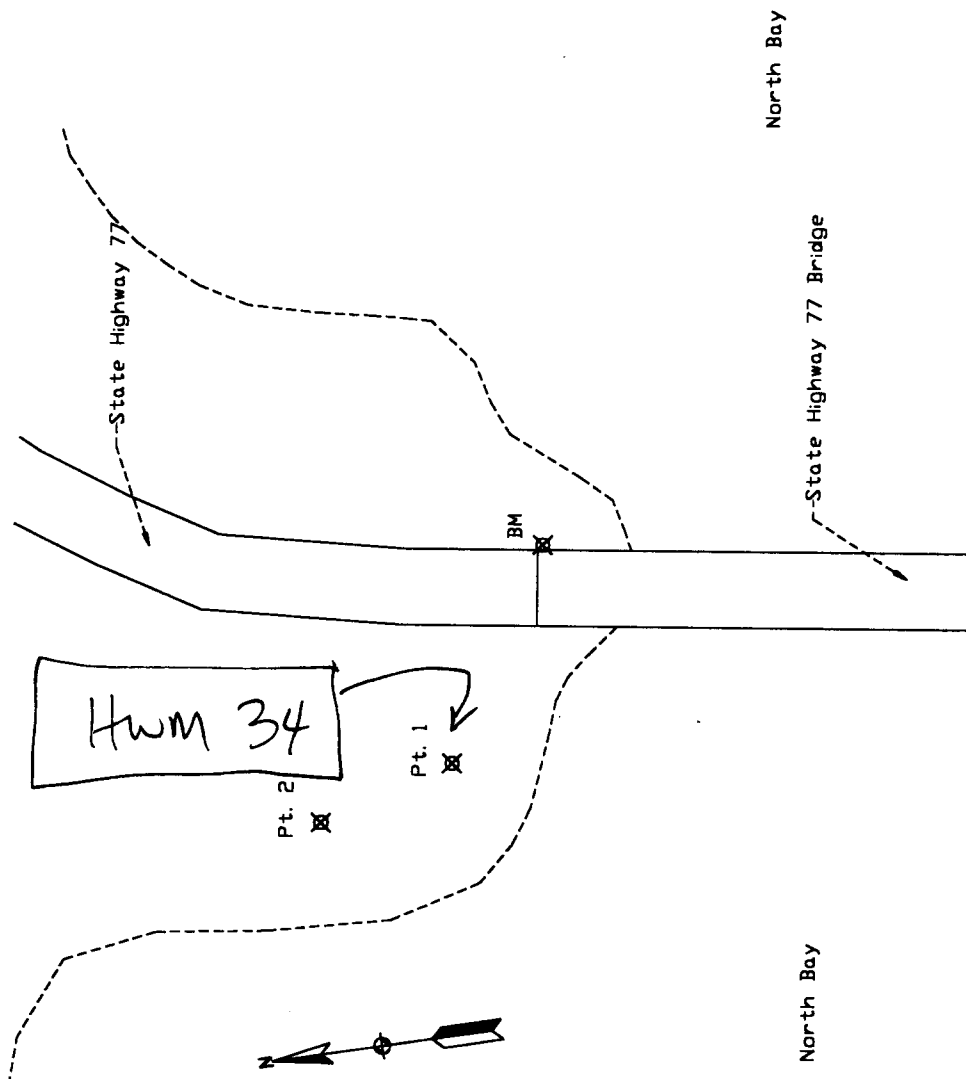
- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

(see attached)

PLAN

ELEVATION

16 a 1/2 b



Hwm 34
(AUG)

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 17a
Sheet 1 of 2

DATE OF REPORT 10/13/95
REPORTING INDIVIDUAL(S) J. J. PIRNELLO / P. SEXTON
ADDRESS AT HWM State Highway 33E Bridge over Burnt Mill Creek
LOCATION DESCRIPTION Pt. 1 is approx. 400 feet NW of NE
corner of bridge
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)
INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____
HWM ELEVATION (FEET) 5.19 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 15.94 DATUM NGVD
SOURCE OF BENCHMARK ELEVATION FL Dept of Transportation - 9154F
BENCHMARK LOCATION NE Corner of bridge, atop concrete
piling
LEVELING METHOD Auto level and philly red
OTHER OBSERVATIONS GPS coordinates - N30°19.7' W 85°45.7'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

MICHAEL BAKER JR., INC.

HWM 34
(AVG)

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 176
Sheet 1 of 2

DATE OF REPORT 10/13/95
REPORTING INDIVIDUAL(S) M. PIRRELLO / P. SEXTON
ADDRESS AT HWM State Highway 338 Bridge over Beant Mill Creek
LOCATION DESCRIPTION Pt. 2 is approx. 415 feet NW c. NE
corner of Highway 338 bridge
DATE OF HWM OCCURRENCE 10/4/95 TIME _____
DURATION OF OCCURRENCE _____
TYPE OF MARK (CHECK ALL THAT APPLY)
INSIDE _____ MUD LINE _____ MARK ON FIXED
OUTSIDE X DEBRIS LINE X STRUCTURE _____
HWM ELEVATION (FEET) 7.14 DATUM NGVD
GROUND ELEVATION (FEET) _____ DATUM _____
BENCHMARK ELEVATION (FEET) 15.94 DATUM NGVD
SOURCE OF BENCHMARK ELEVATION Fl. Dept of Transportation - 9154 F
BENCHMARK LOCATION NE corner of bridge, atop concrete
railing
LEVELING METHOD Auto level and philly red
OTHER OBSERVATIONS GPS coordinates - N 30°19.7' W 85°45.7'

PHOTOGRAPHS: (ROLL # _____, PHOTO # _____)
(ROLL # _____, PHOTO # _____)

(NOTE: Illustrate HWM on sheet 2 with map and sketch.)

Hwm 34
AUG

HURRICANE OPAL
HIGH WATER MARK (HWM) REPORT

Report # 17a 1/2

Sheet 2 of 2

- * Show HWM
- * Show photographs (roll #, photo #) and vantage points and angles
- * Show benchmark location
- * Show North arrow

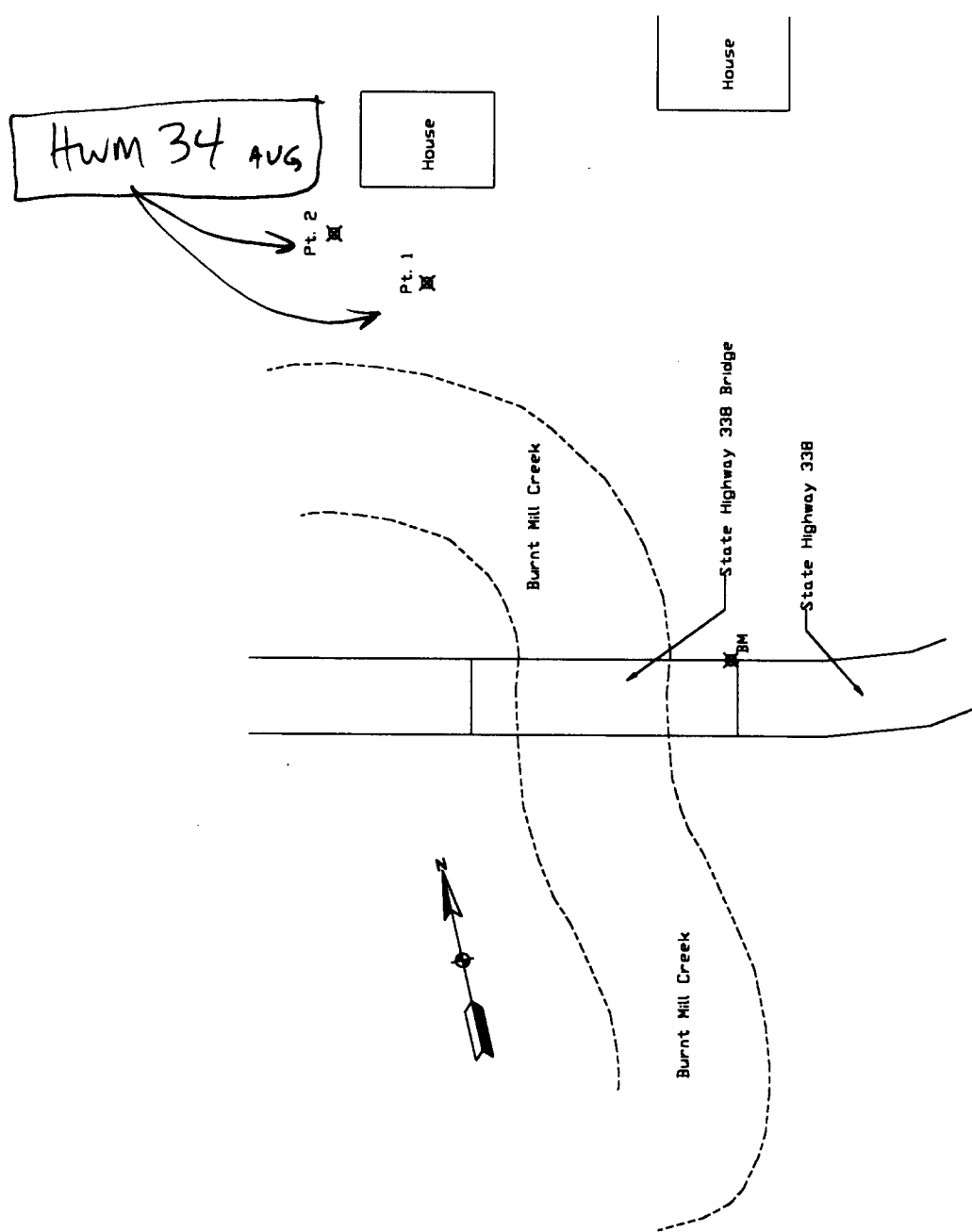
(see attached)

PLAN

ELEVATION

MICHAEL BAKER JR., INC.

17 a & b



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